



DEPARTMENT OF TRANSPORTATION

Federal Aviation Administration

14 CFR Part 39

[Docket No. FAA-2021-0962; Project Identifier AD-2021-00997-T]

RIN 2120-AA64

Airworthiness Directives; The Boeing Company Airplanes

AGENCY: Federal Aviation Administration (FAA), DOT.

ACTION: Notice of proposed rulemaking (NPRM).

SUMMARY: The FAA proposes to adopt a new airworthiness directive (AD) for certain The Boeing Company Model 777-200 and -300 series airplanes. This proposed AD was prompted by reports of three incidents involving in-flight fan blade failures on certain Pratt & Whitney engines (“fan blades” are also known as “1st-stage low-pressure compressor (LPC) blades” – these terms are used interchangeably in this proposed AD). This proposed AD would require installation of debris shields on the thrust reverser (T/R) inner wall at the left and right sides of the lower bifurcation, inspection of the fan cowl doors for moisture ingress, repetitive functional checks of the hydraulic pump shutoff valves to ensure they close in response to the fire handle input, and corrective actions if necessary. The FAA is proposing this AD to address the unsafe condition on these products.

DATES: The FAA must receive comments on this proposed AD by [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

ADDRESSES: You may send comments, using the procedures found in 14 CFR 11.43 and 11.45, by any of the following methods:

- Federal eRulemaking Portal: Go to <https://www.regulations.gov>. Follow the instructions for submitting comments.

- Fax: 202-493-2251.

- Mail: U.S. Department of Transportation, Docket Operations, M-30, West Building Ground Floor, Room W12-140, 1200 New Jersey Avenue SE, Washington, DC 20590.

- Hand Delivery: Deliver to Mail address above between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays.

For Boeing service information identified in this NPRM, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; Internet <https://www.myboeingfleet.com>. For Pratt & Whitney service information identified in this NPRM contact Pratt & Whitney Division, 400 Main Street, East Hartford, CT 06118; phone: 860-565-0140; email: help24@prattwhitney.com; website: <https://connect.prattwhitney.com>. You may view this service information at the FAA, Airworthiness Products Section, Operational Safety Branch, 2200 South 216th St., Des Moines, WA. For information on the availability of this material at the FAA, call 206-231-3195.

Examining the AD Docket

You may examine the AD docket at <https://www.regulations.gov> by searching for and locating Docket No. FAA-2021-0962; or in person at Docket Operations between 9 a.m. and 5 p.m., Monday through Friday, except Federal holidays. The AD docket contains this NPRM, any comments received, and other information. The street address for Docket Operations is listed above.

FOR FURTHER INFORMATION CONTACT: James Laubaugh, Aerospace Engineer, Propulsion Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des

Moines, WA 98198; phone and fax: 206-231-3622; email: james.laubaugh@faa.gov.

SUPPLEMENTARY INFORMATION:

Comments Invited

The FAA invites you to send any written relevant data, views, or arguments about this proposal. Send your comments to an address listed under ADDRESSES. Include “Docket No. FAA-2021-0962; Project Identifier AD-2021-00997-T” at the beginning of your comments. The most helpful comments reference a specific portion of the proposal, explain the reason for any recommended change, and include supporting data. The FAA will consider all comments received by the closing date and may amend this proposal because of those comments.

Except for Confidential Business Information (CBI) as described in the following paragraph, and other information as described in 14 CFR 11.35, the FAA will post all comments received, without change, to <https://www.regulations.gov>, including any personal information you provide. The agency will also post a report summarizing each substantive verbal contact received about this NPRM.

Confidential Business Information

CBI is commercial or financial information that is both customarily and actually treated as private by its owner. Under the Freedom of Information Act (FOIA) (5 U.S.C. 552), CBI is exempt from public disclosure. If your comments responsive to this NPRM contain commercial or financial information that is customarily treated as private, that you actually treat as private, and that is relevant or responsive to this NPRM, it is important that you clearly designate the submitted comments as CBI. Please mark each page of your submission containing CBI as “PROPIN.” The FAA will treat such marked submissions as confidential under the FOIA, and they will not be placed in the public docket of this NPRM. Submissions containing CBI should be sent to James Laubaugh, Aerospace Engineer, Propulsion Section, FAA, Seattle ACO Branch, 2200 South 216th

St., Des Moines, WA 98198; phone and fax: 206-231-3622; email:

james.laubaugh@faa.gov. Any commentary that the FAA receives which is not specifically designated as CBI will be placed in the public docket for this rulemaking.

Background

The FAA has received reports of three incidents involving in-flight fan blade failures and shutdowns on certain The Boeing Company Model 777-200 and 777-300 series airplanes equipped with Pratt & Whitney (P&W) Model PW4000 series turbofan engines. The two most recent events occurred in December 2020 and February 2021. In the latter incident, the engine fan blade failure occurred during climb at approximately 13,000 feet. While the engine fan blade failure was contained by the fan case, the event loads caused structural failures that resulted in the inlet (inlet lip, inner and outer barrel, and aft bulkhead) and fan cowl doors separating from the engine and airplane. The resultant separated engine and nacelle parts caused damage to the wing and fuselage. Several flammable fluid lines, the engine accessory gearbox, and T/R structure were fractured. The hydraulic pump shutoff valve failed to close when the fire handle was pulled, contributing additional flammable fluid to the engine nacelle and T/R resulting in an uncontained engine fire.

In the December 2020 incident, the engine fan blade failure occurred during climb at approximately 15,000 feet. While the engine fan blade failure was contained by the fan case, the event loads caused structural failures that resulted in the fan cowl doors separating from the engine and airplane. The resultant separated engine and nacelle parts caused damage to the left side horizontal stabilizer and fuselage. The engine accessory gearbox and T/R attachment to the engine were also fractured.

In the earliest incident, which occurred in 2018, the engine fan blade failure occurred just after beginning the descent. While the engine fan blade failure was contained by the fan case, the event loads caused structural failures that resulted in the

inlet (inlet lip, inner and outer barrel, and aft bulkhead) and fan cowl doors separating from the engine and airplane. The resultant separated engine and nacelle parts caused damage to the right side horizontal stabilizer, wing and fuselage.

Upon the occurrence of the February 2021 in-flight engine fan blade failure, the FAA issued Emergency AD 2021-05-51, Amendment 39-21470 (86 FR 13445, March 9, 2021) requiring inspection of the engine fan blades for cracking and removal from service if any cracking is found. Since the two most recent incidents and issuance of that Emergency AD, the FAA, Boeing, and P&W have continued to examine the airplane and engine design, along with the information provided through the incident investigations, to determine if further action is necessary. The FAA has determined that further action is necessary to address the airplane-level implications and unsafe condition resulting from in-flight engine fan blade failures. Fan blade failures can cause fan rotor imbalance and result in fan blade fragments penetrating the inner and outer barrel of the inlet. This condition, if not addressed, could result in the separation of inlet and fan cowl doors and the T/R cowl. This could lead to engine in-flight shutdown, impact damage to the empennage, with significantly increased aerodynamic drag causing fuel exhaustion or the inability to maintain altitude during operations under extended-range twin-engine operational performance standards (ETOPS) missions, and uncontrolled engine fire, which could result in loss of control of the airplane, a forced off-airport landing, and injury to passengers.

FAA's Determination

The FAA is issuing this NPRM after determining that the unsafe condition described previously is likely to exist or develop on other products of the same type design.

Related Service Information Under 1 CFR Part 51

The FAA reviewed Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021. This service information specifies procedures for performing thermal acoustic image and ultrasonic testing inspections of 1st-stage LPC blades. This service information is reasonably available because the interested parties have access to it through their normal course of business or by the means identified in ADDRESSES.

Related Service Information

The FAA reviewed Subtasks 26-21-00-200-018, 26-21-00-200-019, and 26-21-00-840-022, of Boeing 777-200/300 Aircraft Maintenance Manual, dated September 5, 2021. The service information specifies procedures for performing a functional check of the engine-driven pump shutoff valve.

Proposed AD Requirements in this NPRM

This proposed AD would require doing the following actions in accordance with a method approved by the Manager, Seattle ACO Branch, FAA.

- Installing debris shields on the T/R inner wall at the left and right sides of the lower bifurcation.
- Inspecting the fan cowl doors for moisture ingress and corrective action (i.e., repair) if necessary.
- Repetitive functional checks of the hydraulic pump shutoff valves to ensure they close in response to the fire handle input, and corrective actions (i.e., repair) if necessary.

Explanation of Special Flight Permit Paragraph

This proposed AD is related to NPRM Docket Number FAA-2021-0959, which proposes to require initial and repetitive ultrasonic testing (UT) inspections and thermal acoustic image inspections for cracks in certain 1st-stage LPC blades and removal of those blades that fail inspection. This proposed AD is also related to NPRM Docket

Number FAA-2021-0963, which proposes to require modifying the engine inlet to withstand fan blade failure event loads. The special flight permit paragraphs in those proposed ADs are similar to the one in this proposed AD. The special flight permit paragraph includes a limitation requiring that the following actions have been done before the special flight is permitted: a flow path UT inspection of the 1st-stage LPC blades for cracking and the 1st-stage LPC blades have been found serviceable, and a functional check of the left and right hydraulic pump shutoff valves to ensure they close in response to the fire handle input within 10 days prior to flight.

Interim Action

The FAA considers that this proposed AD would be an interim action. The manufacturer is currently developing other actions that will address the unsafe condition identified in this proposed AD. Once these actions are developed, approved, and available, the FAA might consider additional rulemaking.

Costs of Compliance

The FAA estimates that this AD, if adopted as proposed, would affect 54 airplanes of U.S. registry. The FAA estimates the following costs to comply with this proposed AD:

Estimated costs

Action	Labor cost	Parts cost	Cost per product	Cost on U.S. operators
Installation of T/R debris shields	115 work-hour X \$85 per hour = \$9,775	\$4,300	\$14,075	\$760,050
Inspection of fan cowl doors	64 work-hours X \$85 per hour = \$5,440	\$0	\$5,440	\$293,760
Functional checks of the hydraulic pump shutoff valves	1 work-hour X \$85 per hour = \$85 per inspection cycle	\$0	\$85 per inspection cycle	\$4,590 per inspection cycle

The FAA has received no definitive data on which to base the cost estimates for the on-condition corrective actions specified in this proposed AD.

Authority for this Rulemaking

Title 49 of the United States Code specifies the FAA's authority to issue rules on aviation safety. Subtitle I, section 106, describes the authority of the FAA Administrator. Subtitle VII: Aviation Programs, describes in more detail the scope of the Agency's authority.

The FAA is issuing this rulemaking under the authority described in Subtitle VII, Part A, Subpart III, Section 44701: General requirements. Under that section, Congress charges the FAA with promoting safe flight of civil aircraft in air commerce by prescribing regulations for practices, methods, and procedures the Administrator finds necessary for safety in air commerce. This regulation is within the scope of that authority because it addresses an unsafe condition that is likely to exist or develop on products identified in this rulemaking action.

Regulatory Findings

The FAA determined that this proposed AD would not have federalism implications under Executive Order 13132. This proposed AD would not have a substantial direct effect on the States, on the relationship between the national Government and the States, or on the distribution of power and responsibilities among the various levels of government.

For the reasons discussed above, I certify this proposed regulation:

- (1) Is not a "significant regulatory action" under Executive Order 12866,
- (2) Would not affect intrastate aviation in Alaska, and
- (3) Would not have a significant economic impact, positive or negative, on a substantial number of small entities under the criteria of the Regulatory Flexibility Act.

List of Subjects in 14 CFR Part 39

Air transportation, Aircraft, Aviation safety, Incorporation by reference, Safety.

The Proposed Amendment

Accordingly, under the authority delegated to me by the Administrator, the FAA proposes to amend 14 CFR part 39 as follows:

PART 39 - AIRWORTHINESS DIRECTIVES

1. The authority citation for part 39 continues to read as follows:

Authority: 49 U.S.C. 106(g), 40113, 44701.

§ 39.13 [Amended]

2. The FAA amends § 39.13 by adding the following new airworthiness directive:

The Boeing Company: Docket No. FAA-2021-0962; Project Identifier AD-2021-00997-T.

(a) Comments Due Date

The FAA must receive comments on this airworthiness directive (AD) by [INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER].

(b) Affected ADs

None.

(c) Applicability

This AD applies to The Boeing Company airplanes, certificated in any category, as specified in paragraphs (c)(1) and (2) of this AD.

(1) Model 777-200 series airplanes equipped with Pratt & Whitney PW4074, PW4074D, PW4077, PW4077D, PW4084D, PW4090, and PW4090-3 model turbofan engines.

(2) Model 777-300 series airplanes equipped with Pratt & Whitney PW4090 and PW4098 model turbofan engines.

(d) Subject

Air Transport Association (ATA) of America Code 71, Powerplant.

(e) Unsafe Condition

This AD was prompted by reports of three incidents involving in-flight fan blade failures on certain Pratt & Whitney engines. The FAA is issuing this AD to address engine fan blade failure, which could result in the separation of inlet and fan cowl doors and the thrust reverser (T/R) cowl. This could lead to engine in-flight shutdown, impact damage to the empennage, with significantly increased aerodynamic drag causing fuel exhaustion or the inability to maintain altitude during operations under extended-range twin-engine operational performance standards (ETOPS) missions, and uncontrolled engine fire, which could result in loss of control of the airplane, a forced off-airport landing, and injury to passengers.

(f) Compliance

Comply with this AD within the compliance times specified, unless already done.

(g) Installation and Inspections

Before further flight after the effective date of this AD, do the actions specified in paragraphs (g)(1) through (3) of this AD, in accordance with a method approved by the Manager, Seattle ACO Branch, FAA. Repeat the functional check specified in paragraph (g)(3) of this AD thereafter at intervals not to exceed 10 days.

(1) Install debris shields on the T/R inner wall at the left and right sides of the lower bifurcation.

(2) Inspect the fan cowl doors for moisture ingress. If any moisture ingress is found, repair before further flight.

(3) Do a functional check of the left and right hydraulic pump shutoff valves to ensure they close in response to the fire handle input. If any hydraulic pump shutoff valve

does not close, before further flight perform corrective actions until it closes in response to the fire handle input.

Note (1) to paragraph (g)(3): Guidance for accomplishing the actions required by paragraphs (g)(3) and (h)(2) of this AD can be found in the “Engine-Driven Pump (EDP) Shutoff Valve Check” (Subtasks 26-21-00-200-018, 26-21-00-200-019, and 26-21-00-840-022) of Boeing 777-200/300 Aircraft Maintenance Manual.

(h) Special Flight Permit

Special flight permits, as described in 14 CFR 21.197 and 21.199, are not permitted except for airplanes on which the actions specified in paragraphs (h)(1) and (2) of this AD have been done.

(1) A flow path ultrasonic testing (UT) inspection of the 1st-stage low-pressure compressor (LPC) blades for cracking has been done as specified in the Accomplishment Instructions, Part A – Initial Inspection of All LPC Fan Blades Prior to their Return to Service, paragraph 1.A., of Pratt & Whitney Alert Service Bulletin PW4G-112-A72-361, dated October 15, 2021, and the 1st-stage LPC blades have been found serviceable.

(2) A functional check of the left and right hydraulic pump shutoff valves to ensure they close in response to the fire handle input and all applicable corrective actions (i.e., repair) within 10 days prior to flight.

(i) Credit for Previous Actions

This paragraph provides credit for the actions specified in paragraph (h)(1) of this AD, if those actions were performed before the effective date of this AD using the service information specified in paragraph (i)(1), (2), or (3) of this AD.

(1) Paragraph 2. of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 85F-21, dated May 12, 2021, for a flow path UT inspection.

(2) Paragraph 1.a) of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 130F-21, dated July 1, 2021, for a flow path UT inspection.

(3) Paragraph 2.a) of the Accomplishment Instructions of Pratt & Whitney Special Instruction No. 130F-21, Revision A, dated July 28, 2021, for a flow path UT inspection.

(j) Alternative Methods of Compliance (AMOCs)

(1) The Manager, Seattle ACO Branch, FAA, has the authority to approve AMOCs for this AD, if requested using the procedures found in 14 CFR 39.19. In accordance with 14 CFR 39.19, send your request to your principal inspector or responsible Flight Standards Office, as appropriate. If sending information directly to the manager of the certification office, send it to the attention of the person identified in paragraph (k)(1) of this AD. Information may be emailed to: 9-ANM-Seattle-ACO-AMOC-Requests@faa.gov.

(2) Before using any approved AMOC, notify your appropriate principal inspector, or lacking a principal inspector, the manager of the responsible Flight Standards Office.

(k) Related Information

(1) For more information about this AD, contact James Laubaugh, Aerospace Engineer, Propulsion Section, FAA, Seattle ACO Branch, 2200 South 216th St., Des Moines, WA 98198; phone and fax: 206-231-3622; email: james.laubaugh@faa.gov.

(2) For Boeing service information identified in this AD, contact Boeing Commercial Airplanes, Attention: Contractual & Data Services (C&DS), 2600 Westminister Blvd., MC 110-SK57, Seal Beach, CA 90740-5600; telephone 562-797-1717; Internet <https://www.myboeingfleet.com>. For Pratt & Whitney service information identified in this AD contact Pratt & Whitney Division, 400 Main Street,

East Hartford, CT 06118; phone: 860-565-0140; email: help24@prattwhitney.com;
website: <https://connect.prattwhitney.com>. You may view this referenced service
information at FAA, Airworthiness Products Section, Operational Safety Branch, 2200
South 216th St., Des Moines, WA. For information on the availability of this material at
the FAA, call 206-231-3195.

Issued on December 14, 2021.

Lance T. Gant, Director,
Compliance & Airworthiness Division,
Aircraft Certification Service.

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